RESTORING RAISED BOG IN IRELAND
Project Reference: LIFE04 NAT/IE/000121

A REPORT ON THE RESTORATION OF PROJECT SITE No. 8

CLOONSHANVILLE BOG, Co. ROSCOMMON

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September 2008

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General Site Description

Cloonshanville Bog is a large raised bog site located 1.5km north of Frenchpark, Co. Roscommon. The eastern boundary of the site is the Breedoge River and the southern boundary is the Frenchpark/Elphin road. Agricultural land borders the site to the west and active peat-cutting occurs to the east. The bog is underlain by low-permeability, clay limestones and the bog developed in a shallow basin in a groundwater discharge zone. The regional water table has been lowered by arterial drainage to the Breedoge River, but evidence of groundwater inputs are seen on and around the high bog (NPWS, 1997).

The vegetation of the intact bog surface is largely dominated by Ling Heather (*Calluna vulgaris*), Deergrass (*Trichophorum caespitosum*) and Hare's tail Cottongrass (*Eriophorum vaginatum*). Other frequent species include Cranberry (*Vaccinium oxycoccus*), Cross-leaved Heath (*Erica tetralix*), Bog Asphodel (*Narthecium ossifragum*) and Common Cottongrass (*E. angustifolium*). In the wetter areas hummock/pool systems have developed. The cover of lichens (*Cladonia* spp.) and Bog Mosses (*Sphagnum* spp.) is generally good and the scarce Bog Moss species, *S. imbricatum, S. fuscum* and *S. pulcrum* also occur. A large flush area occurs in the centre of the high bog dome. The main body of the flush supports an extensive area of Bog Woodland, listed as a priority Annex I Habitat under the EU Habitats Directive and an extremely rare woodland type in Ireland. Three areas of conifer plantation have been included within the site for hydrological reasons (NPWS, 1997).

The most noteworthy ecological feature of the site is the presence of a large linear flush, approximately 700 metres in length, which traverses the site running in a north-west to south-east direction. The area of Bog Woodland is approximately 14 hectares in size and is considered to be one of the best examples of bog woodland habitat in the country. The woodland is well-developed structurally and contains a diverse range of plant species. The low canopy of the woodland is dominated by Downy Birch (*Betula pubescens*) with some Willow (*Salix* spp.) occurring and with species such as Purple Moor-grass (*Molinia caerulea*) and Bog Myrtle (*Myrica gale*) frequent underneath. During the initial project survey, a population of White sedge (*Carex curta*) – a nationally rare species - was found growing along the margins of the flush (Conaghan, 2003).

The site is very diverse containing a substantial area of open bog, an extensive linear flush (colonised by bog woodland) and an area of calcareous fen. It has been estimated that there are approximately 152 hectares of high bog remaining within the site. The site also supports a large population of the bog moss *Sphagnum pulcrum*, a nationally rare species in Ireland (Douglas and Grogan, 1985).

Project Site Description (Pre-restoration)

The project area consists of 34.2 hectares of conifer plantation within the cSAC and these occur in 3 distinct conifer blocks. The site was surveyed in 2003, prior to restoration, which found that the conifer plantations consisted mainly of Lodgepole Pine (*Pinus contorta*). In one area Sitka Spruce (*Picia sitchensis*) was unsuccessfully planted on calcareous fen, which occupies the site of a former lake. In the north of the site a large section of conifers had grown very poorly on bog and a well-developed bog groundflora still existed. To the south of the cSAC a block of mature conifer plantation occurred, which was dominated by tall Lodegpole Pine with little or no bog vegetation underneath (Conaghan, 2003).

Description of bog vegetation adjoining planted areas

Most the bog vegetation adjoining the planted areas comprises intact raised bog which is wet but mostly non-quaking and tends to contain large proportions of Ling Heather, Hare's-tail Cotton-grass and Bog Asphodel. A small area with well-developed pools lies immediately to the south of the bog woodland and *Sphagnum pulchrum* is abundant in this area. A small area of flush vegetation dominated by Purple Moor-grass, Bog Myrtle and Common Reed (*Phragmites australis*) with patches of Black Bog-rush (*Schoenus nigricans*) lies immediately to the north-west of the recently planted fen. In the past this area would have been continuous with the adjoining area of fen.

Restoration Actions

At this site the main restoration measures undertaken were the clear-felling and removal of the mature conifer crop, felling-to-waste and wind-rowing of the remaining stunted conifers and brash and blocking of drains with peat dams. Follow-up work included the control of the natural regeneration of conifer seedlings.

Heavy machinery was excluded from the fen area in view of the high ecological value of the fen vegetation present. The blocking of drains in the fen area is not recommended until more is known about the overall hydrology of the area and a detailed hydrological study of this area should be carried out before any drain blocking is attempted.

2. Methods

Prior to the start of restoration activities at the site, the habitats and vegetation occurring was surveyed and described (Conaghan, 2003). During the initial restoration work of 2005, permanent quadrats were established on each of the vegetation types within the project site.

During the field survey, particular attention was paid to the possible occurrence of plant and animal species which are considered to be rare in both a national and local context with particular emphasis on animal species listed in Annex II of the E.U. Habitats Directive and plant species listed in the Irish Red Data Book for vascular plants (Curtis and McGough, 1988), the 1999 Flora Protection Order and Annex II of the E.U. Habitats Directive.

3. Site Photographs

During the initial fieldwork a number of colour photographs of the site and vegetation encountered were taken with a digital camera and a selection of these are presented in this report. These include photographs taken by the Project Ecologist in order to illustrate the vegetation descriptions and changes in the habitats/vegetation present over time.

4. Vegetation of Project Site

Although the conifers formed a closed canopy in places, bog vegetation remained in the more open areas, dominated by Ling Heather, the lichen *Cladonia portentosa* and various mosses (Conaghan, 2003). The tree growth was very poor in the north-western half of the fen and, as a result, there was still a good cover of fen vegetation present. This calcareous fen vegetation was dominated by Bog Myrtle and Purple Moor-grass with the numerous wet drains colonised by various sedges including Whip Sedge (*Carex lasiocarpa*) and Tufted sedge (*C. elata*).

5. Changes in Overall Vegetation/Habitat Cover

Much of the site is now cleared of conifers and drains have been blocked with peat dams. The brash which remained after clear-felling has been wind-rowed to allow bog vegetation to re-colonise the exposed peat surface. With the removal of conifers and blocking of drains, there was a rise in the water-table, which allowed for the colonisation of bog species including *Sphagnum* mosses.

6. Vegetation Monitoring Quadrats

The vegetation changes which have taken place within the site over the period of the restoration project are shown by means of observed changes in permanent quadrats. Seven permanent quadrats were installed on this site, which were described and photographed to monitor changes in vegetation over time. In order to ensure the future position of quadrats the corners have been marked with short stakes and an 8-figure GPS reading was also recorded. Each 10m x10m quadrat, was photographed annually and vegetation tables are presented below.

Quadrat 1: This quadrat is located on the northern margin of Cloonshanville Bog and occurred on open bog with a ground cover of Ling Heather, Cross-leaved Heath, Hare's-tail Cotton-grass and *Sphagnum* moss. Over time, as the adjoining plantation becomes wetter, conditions of this raised bog habitat will improve and *Sphagnum* cover may increase further.

Cloonshanville Quadrat 1

Area: 10 x 10m **Location:** 20m West W4 **Grid Ref:** M7541 9194 **Altitude:** 68m
Bog Type: High Bog **Ecotope:** Sub-marginal **Slope:** Flat **Aspect:** NA
Landuse: Unplanted **Management:** Non-intervention

Date	**26/08/2005**	**09/08/2006**	**31/07/2007**	**13/08/2008**
Firmness	Soft	Soft	Soft	V. Soft
Drains	No	No	No	No
Canopy Cover %	0	0	0	0
Canopy Height	0	0	0	0
Vegetation Cover %	99	100	100	100
Vegetation Height (cm)	30	30	30	30
Dwarf Shrub Cover %	35	40	35	50
Herb Cover %	35	55	50	50
Bryophyte Cover %	57	70	25	70
Sphagnum cover %	56	50	25	50
Open Water %	1	1	0	1
Brash cover %	0	0	0	0
Pine Needle cover %	0	0	0	0
Pine Needle Depth cm	0	0	0	0
Bare Peat %	1	0	0	0
Species number	**15**	**12**	**13**	**16**
Myrica gale				1
Calluna vulgaris	30	30	30	40
Erica tetralix	5	10	5	10
Carex panicea			5	5
Eriophorium vaginatum	25	50	40	40
E. angustifolium	5			3
Rhyncospora alba	2		1	2
Andromeda polifolia			2	
Drosera rotundifolia	2	4	2	1
Vaccinium oxycoccos	1	1		
Cladonia portentosa	20	30	10	40
C. uncilais	5	5	5	5
Hypnum jutlandicum	10	20		20
Sphagnum cuspidatum	1	1	2	2
S. capillifolium	20	20	10	20
S. subnitens	20	20	3	20
S. magellanicum	10		10	5
S. imbricatum	5	10		5

Cloonshanville Quadrat 1, 2005

Cloonshanville Quadrat 1, 2008

Quadrat 2: This quadrat is located on the northern margin of Cloonshanville Bog and occurred within an open canopy conifer plantation with a ground cover containing Ling Heather, Hare's-tail Cotton-grass some Cranberry and *Sphagnum* moss. With the felling to waste of the conifers and blocking of drains, bog vegetation cover will increase. Over time, raised bog habitat will establish.

Cloonshanville Quadrat 2

Area: 10 x 10m **Location:** 50m South W12 **Grid Ref:** M7532 9203 **Altitude:** 65m
Bog Type: High Bog **Ecotope:** NA **Slope:** Slight **Aspect:** North
Landuse: Forestry **Management:** Fell to Waste

Date	**26/08/2006**	**09/08/2006**	**31/07/2007**	**13/08/2008**
Firmness	Soft	Firm	Firm	Soft
Drains	Yes	Yes	Yes	Yes/Blocked
Canopy Cover %	75	75	0	0
Canopy Height	5	5	0	0
Vegetation Cover %	90	90	20	50
Vegetation Height (cm)	50	100	40	50
Dwarf Shrub Cover %	30	30	5	10
Herb Cover %	40	25	15	40
Bryophyte Cover %	80	90	40	60
Sphagnum cover %	50	55	15	30
Open Water %	0	0	0	0
Brash cover %	0	0	25	20
Pine Needle cover %	10	10	25	5
Pine Needle Depth cm	1	1	1	1
Bare Peat %	0	0	0	5
Species number	**15**	**16**	**10**	**15**
Pinus contorta	75	75		1
Epiolobium spp				5
Empetrum nigrum				2
Vaccinium myrtilus	2	5		
Calluna vulgaris	25	20	5	10
Erica tetralix	5	5		
Eriophorium vaginatum	30	15	10	25
E. angustifolium	1	5		5
Andromeda polifolia	3	2		1
Vaccinium oxycoccos	5	5	2	5
Cladonia portentosa	20	20	5	10
Campylopus atroverins		5		5
Hypnum cupressiforme	5			
Hypnum jutlandicum	20	25	25	25
Polytricum commune	5	10	1	
Sphagnum recurvum	15	10		5
S cuspidatum			1	
S. capillifolium	25	10	10	10
S. subnitens	10	25	1	10
S. magellanicum		10	3	5

Cloonshanville Quadrat 2, 2005

Cloonshanville Quadrat 2, 2008

Quadrat 3: This quadrat is located on the southern margin of the northern plantation on Cloonshanville Bog. This quadrat occurred within open canopy conifer plantation with a flushed ground cover containing Ling Heather, Crowberry, Hare's-tail cotton-grass, abundant Cranberry and *Sphagnum* moss. With the felling to waste of the conifers and blocking of drains**,** bog vegetation cover will increase. Over time, raised bog habitat will establish, with the possible extension of the Bog woodland habitat from the adjacent flush.

Cloonshanville Quadrat 3

Area: 10 x 10m **Location:** 00m South-west W5 **Grid Ref:** M7533 9187 **Altitude:** 64m
Bog Type: High Bog **Ecotope:** NA **Slope:** Flat **Aspect:** NA
Landuse: Forestry **Management:** Fell to Waste

Date	**26/08/2005**	**09/08/2006**	**24/08/2007**	**13/08/2008**
Firmness	Soft	Soft	Firm	Soft
Drains	Yes	Yes	Yes	Yes/Blocked
Canopy Cover %	60	50	0	0
Canopy Height	3	3	0	0
Vegetation Cover %	85	98	60	75
Vegetation Height (cm)	50	50	20	20
Dwarf Shrub Cover %	45	60	30	35
Herb Cover %	40	25	30	40
Bryophyte Cover %	70	70	25	30
Sphagnum cover %	60	55	20	30
Open Water %	0	0	0	2
Brash cover %	0	0	40	20
Pine Needle cover %	5	0	10	1
Pine Needle Depth cm	5	0	1	1
Bare Peat %	0	2	0	1
Species number	**15**	**17**	**12**	**14**
Pinus contorta	60	50	1	2
Empetrum nigrum	20	25	20	20
Vaccinium myrtilus	3	10		
Calluna vulgaris	20	20	5	10
Erica tetralix	2	5	3	5
Eriophorium vaginatum	25	20	20	20
E. angustifolium				3
Andromeda polifolia	5	1	1	5
Vaccinium oxycoccos	10	5	10	10
Cladonia portentosa	8	20	10	10
C. uncilais	1	1		
Campylopus atroverins	4			
Hypnum jutlandicum	5	10	5	
Polytricum commune		5		
Sphagnum recurvum	10	5		2
S cuspidatum				2
S. capillifolium	20	30	10	10
S. papillosum		5		
S. subnitens	20	15	5	10
S. magellanicum	10	5	5	5

Cloonshanville Quadrat 3, 2005

Cloonshanville Quadrat 3, 2008

Quadrat 4: This quadrat is located on the north-eastern margin of Cloonshanville Bog and occurred within stunted conifer plantation, planted on calcareous fen with a ground cover containing Purple Moor-grass, Bog Myrtle, Common Reed, Ling Heather and some *Sphagnum* moss. With the felling to waste of the conifers, fen vegetation dominates and over time calcareous fen habitat will be re-established.

Cloonshanville Quadrat 4

Area: 10 x 10m **Location:** 30m North-east W8 **Grid Ref:** M7573 9119 **Altitude:** 58m
Bog Type: Lagg/Fen **Ecotope:** NA **Slope:** Flat **Aspect:** NA
Landuse: Forestry **Management:** Fell to Waste

Date	**26/08/2005**	**09/08/2006**	**02/08/2005**	**13/08/2008**
Firmness	Firm	Soft	Firm	Firm
Drains	Yes	Yes	Yes	Yes
Canopy Cover %	2	0	0	0
Canopy Height	0.5	0	0	0
Vegetation Cover %	100	100	95	100
Vegetation Height (cm)	100	100	60	100
Dwarf Shrub Cover %	50	50	40	45
Herb Cover %	48	50	55	55
Bryophyte Cover %	20	1	5	10
Sphagnum cover %	20	0	5	10
Open Water %	0	5	5	0
Brash cover %	0	0	0	0
Pine Needle cover %	0	0	0	0
Pine Needle Depth cm	0	0	0	0
Bare Peat %	0	0	0	0
Species number	**12**	**12**	**12**	**16**
Pinus contorta	2			
Picea sitchensis	1	1	1	1
***Salix* spp.**			5	
Potentilla erecta	1	3	2	5
Phragmites australis	10	10	5	10
***Equisetum* spp.**				5
Juncus effusus		1		
Mentha aquatica	1			
Succissa pratensis				5
Schoemus nigricans				5
Molinia caerulea	30	20	15	20
Myrica gale	35	40	35	30
Calluna vulgaris	10	5	5	10
Erica tetralix	5	5	2	5
Menyanthes trifoliata	2	3	10	5
Narthecium ossifragum	2	2	10	3
Eriophorium vaginatum		10	5	5
Vaccinium oxycoccos				2
Campylopus atroverins		1		
Sphagnum capillifolium				5
S. magellanicum	20		5	5

Cloonshanville Quadrat 4, 2005

Cloonshanville Quadrat 4, 2008

Quadrat 5: This quadrat is located within the mature conifer plantation on the southern margin of Cloonshanville Bog and occurred under closed canopy conifers with a ground cover containing some *Hypnum* moss, but mainly dominated by pine needles. With the felling to waste of the conifers and blocking of drains, it can be seen that raised bog vegetation of Ling Heather and *Sphagnum* established. Over time, as this area becomes wetter, raised bog habitat cover will be increased.

Cloonshanville Quadrat 5

Area: 10 x 10m **Location:** 50m North W3 **Grid Ref:** M7479 9019 **Altitude:** 63m
Bog Type: High Bog **Ecotope:** NA **Slope:** Slight **Aspect:** South
Landuse: Forestry **Management:** Clearfell

Date	**26/08/2005**	**09/08/2006**	**24/08/2008**	**13/08/2008**
Firmness	Very Dry	V. Firm	Soft	Soft
Drains	Yes	Yes	Yes/Blocked	Yes/Blocked
Canopy Cover %	100	0	0	0
Canopy Height	5	0	0	0
Vegetation Cover %	10	2	25	45
Vegetation Height (cm)	0	5	10	30
Dwarf Shrub Cover %	0	0	5	30
Herb Cover %	0	3	10	15
Bryophyte Cover %	10	2	12	30
Sphagnum cover %	0	1	1	10
Open Water %	0	0	5	10
Brash cover %	5	75	30	20
Pine Needle cover %	80	25	20	5
Pine Needle Depth cm	10	5	5	5
Bare Peat %	0	0	10	5
Species number	**2**	**4**	**10**	**16**
Pinus contorta	100	2	5	1
Betula pubescens			1	1
***Salix* spp.**				1
Rubus spp		1	1	2
Molinia caerulea				1
Holcus lanatus				5
***Pteridium* spp**				1
***Epiolobium* spp.**				5
Calluna vulgaris			5	30
Eriophorium vaginatum			1	5
Drosera anglica				1
Campylopus atroverins			5	10
Hypnum jutlandicum	10	1	10	5
Polytricum commune			1	10
Sphagnum recurvum		1		
S. capillifolium			1	
S. subnitens				5
S. magellanicum				5

Cloonshanville Quadrat 5, 2006

Cloonshanville Quadrat 5, 2008

Quadrat 6: This quadrat is located on the north-west margin of Cloonshanville Bog and occurred on open bog with pools and ground cover containing Ling Heather, Cross-leaved Heath, White-beaked Sedge, Hare's-tail cotton-grass, Bog Asphodel, Bog Bean and abundant *Sphagnum* moss. This active raised bog habitat will be protected by felling of conifers and drain- blocking in adjoining plantations.

Cloonshanville Quadrat 6

Area: 10 x 10m **Location:** 10m West W9 **Grid Ref:** M7479 9198 **Altitude:** 66
Bog Type: High Bog **Ecotope:** Sub-central **Slope:** Flat **Aspect:** NA
Landuse: Unplanted **Management:** Non-intervention

Date	**26/08/2006**	**09/08/2006**	**31/07/2007**	**13/08/2008**
Firmness	Very soft	V soft	Very soft	Vsoft/Quaking
Drains	No	No	No	No
Canopy Cover %	0	0	0	0
Canopy Height	0	0	0	0
Vegetation Cover %	95	90	95	90
Vegetation Height (cm)	20	20	10	20
Dwarf Shrub Cover %	25	30	30	20
Herb Cover %	40	55	55	70
Bryophyte Cover %	70	60	65	65
Sphagnum cover %	70	60	65	65
Open Water %	15	10	5	10
Brash cover %	0	0	0	0
Pine Needle cover %	0	0	0	0
Pine Needle Depth cm	0	0	0	0
Bare Peat %	0	0	0	0
Species number	**18**	**17**	**13**	**17**
Calluna vulgaris	20	20	20	15
Erica tetralix	5	10	10	5
Menyanthes trifoliata	5	5	5	5
Narthecium ossifragum	5	3	2	5
Carex panicea		2	3	5
Eriophorium vaginatum	5	20	20	20
E. angustifolium	10	5		5
Rhyncospora alba	10	20	20	25
Drosera rotundifolia		1		2
D. anglica	3	1	5	3
Cladonia portentosa	18	20	20	20
Sphagnum cuspidatum	5	8	20	3
S. auriculatum	5			
S. capillifolium	20	15	15	10
S. papillosum			10	
S. tenellum		2		
S. subnitens	10	5		20
S. magellanicum	20	25	20	20
S. imbricatum	5	5		2
S. pulcrum	5			10
***Algae* spp.**				5

Cloonshanville Quadrat 6, 2006

Cloonshanville Quadrat 6, 2008

Quadrat 7: This quadrat is located to the south-west of the northern plantation on Cloonshanville Bog and occurred on open bog with a ground cover containing Ling Heather, Cross-leaved Heath, Hare's-tail Cotton-grass, Bog Myrtle, Bog Bean and abundant *Sphagnum* moss. With the felling to waste of the conifers on the adjoining plantation and blocking of drains, this active raised bog habitat will be protected.

Cloonshanville Quadrat 7

Area: 10 x 10m **Location:** 20m South W6 **Grid Ref:** M7497 9189 **Altitude:** 61m
Bog Type: High Bog **Ecotope:** Sub-central **Slope:** Flat **Aspect:** NA
Landuse: Unplanted **Management:** Non-intervention

Date	**26/08/2005**	**09/08/2006**	**31/07/2007**	**13/08/2008**
Firmness	Very soft	V Soft	Very soft	V.Soft/Quaking
Drains	No	No	No	No
Canopy Cover %	0	0	0	0
Canopy Height	0	0	0	0
Vegetation Cover %	90	95	95	95
Vegetation Height (cm)	50	50	40	50
Dwarf Shrub Cover %	40	55	50	55
Herb Cover %	30	40	45	45
Bryophyte Cover %	80	70	45	75
Sphagnum cover %	75	65	45	70
Open Water %	10	5	5	10
Brash cover %	0	0	0	0
Pine Needle cover %	0	0	0	0
Pine Needle Depth cm	0	0	0	0
Bare Peat %	0	0	0	0
Species number	**17**	**18**	**12**	**17**
Empetrum nigrum		5		
Vaccinium myrtilus			2	2
Myrica gale	5	10	15	10
Calluna vulgaris	30	40	30	40
Erica tetralix	5	5	3	3
Menyanthes trifoliata	5	10	10	3
Eriophorium vaginatum	20	20	25	30
E. angustifolium	1			
Rhyncospora alba	2	5	5	3
Andromeda polifolia				2
Drosera rotundifolia		3	2	2
D. anglica	1	2		
Vaccinium oxycoccos	1	1	2	
Cladonia portentosa	20	30		20
Hypnum jutlandicum	5	5		5
S cuspidatum	5	5	10	5
S. auriculatum	5			
S. capillifolium	20	20	20	20
S. tenellum		5		5
S. subnitens	15	5		10
S. magellanicum	25	25	15	25
S. pulcrum	5	5		5

Cloonshanville Quadrat 7, 2005

Cloonshanville Quadrat 7, 2008

7. Changes in Water-levels

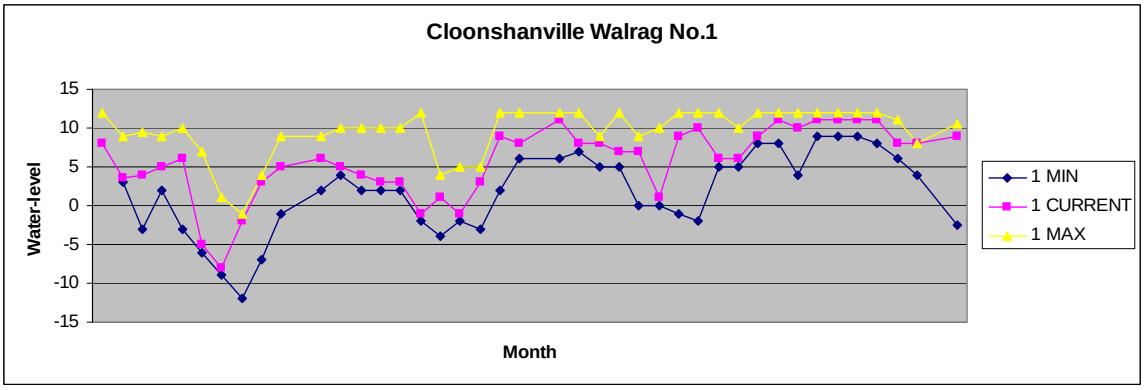
Prior to restoration, Walrags were installed in the conifer plantations and adjacent high bog to record any changes in water-levels, due to tree removal and drain blocking. Water-levels were found to be up to **50cm** below the surface during the summer months. With the removal of conifers and drain-blocking, there was a rise in the water-table within the plantations and on the adjacent high bog and the water-table remains close to the bog surface throughout most of the year.

8. Hydrological Monitoring (Walrag) Graphs

In total, 12 Walrags were installed on this site. The rise in water-levels is clearly seen in the following graphs.

Cloonshanville Bog Walrag 1

Located in firebreak beside clearfell on high bog, water-levels drop 10cm below surface prior restoration*, at ground level or above post restoration



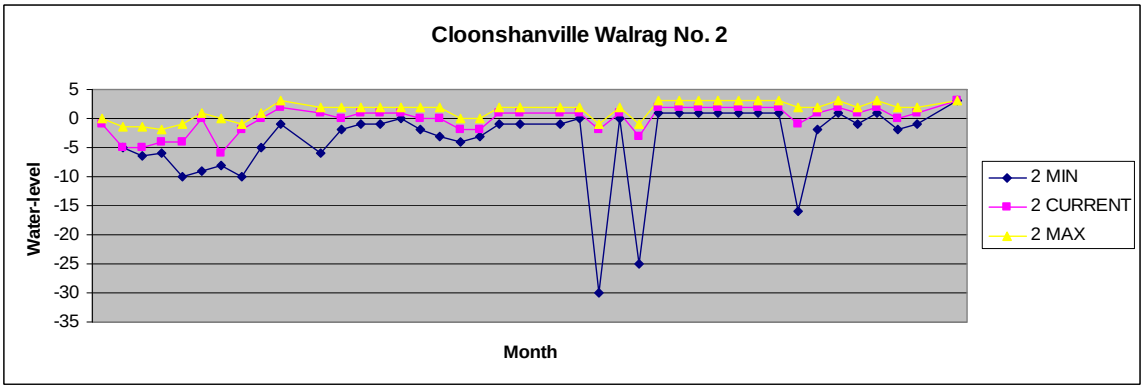
Jan 2005 (Installed) Jul 2006 Jul 2007 Aug 2008

***Clearfell** ***Drain-blocking**

Cloonshanville Bog Walrag 2

Located in firebreak beside clearfell on high bog, water-levels within 10 cm of bog surface prior restoration*, water-levels at bog surface post restoration

(Large variations in March 2007/08 are caused by proximity of heavy machinery during restoration)

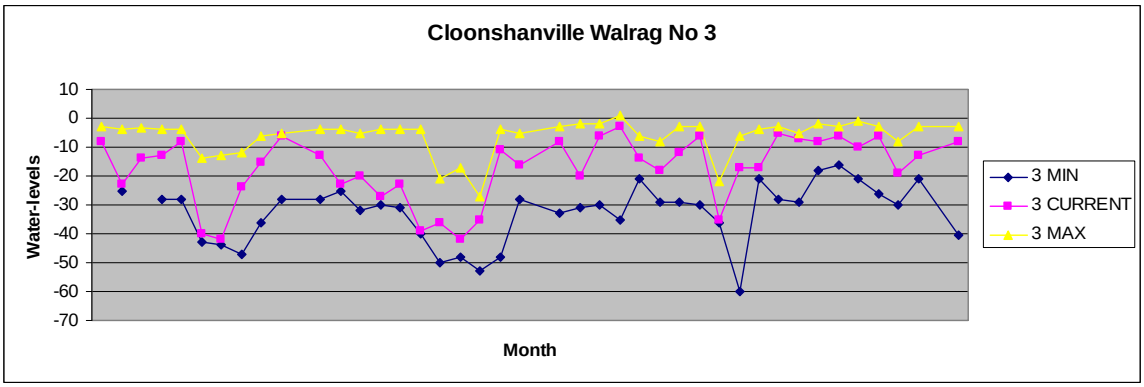


Jan 2005 (Installed) * Jul 2006 Mar 2007 Aug 2008

***Clearfell** **Drain-blocking**

Cloonshanville Bog Walrag 3

Located in firebreak within clearfell on high bog, water-levels drop to 50cm below surface during summer months prior restoration*, but remain within 30cm post restoration

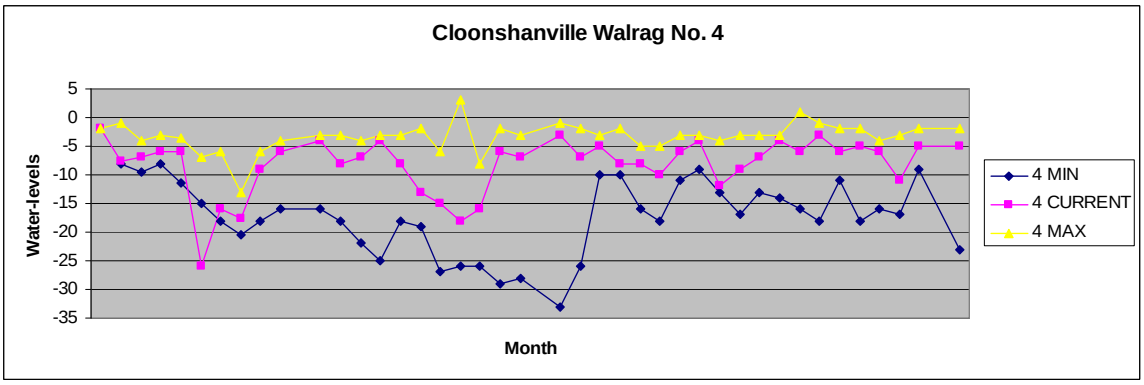


Jan 2005 (Installed) * Aug 2006 Sept 2007 Aug 2008

*Clearfell Drain-blocking

Cloonshanville Bog Walrag 4

Located on open high bog, adjacent to northern conifer plantation, water-levels can drop below 30 cm of bog surface prior restoration*, have risen to within 15cm post restoration

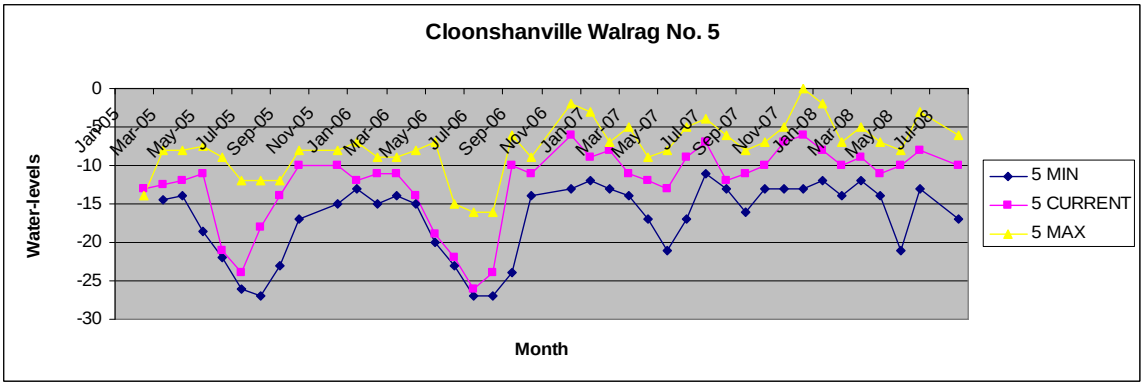


Jan 2005 (Installed) * Dec 2006 Aug 2008

*Clearfell & Drain-blocking

Cloonshanville Bog Walrag 5

Located in fell to waste on high bog, water-levels drop below 25cm during summer months prior restoration*, remain within 15cm of bog surface post restoration

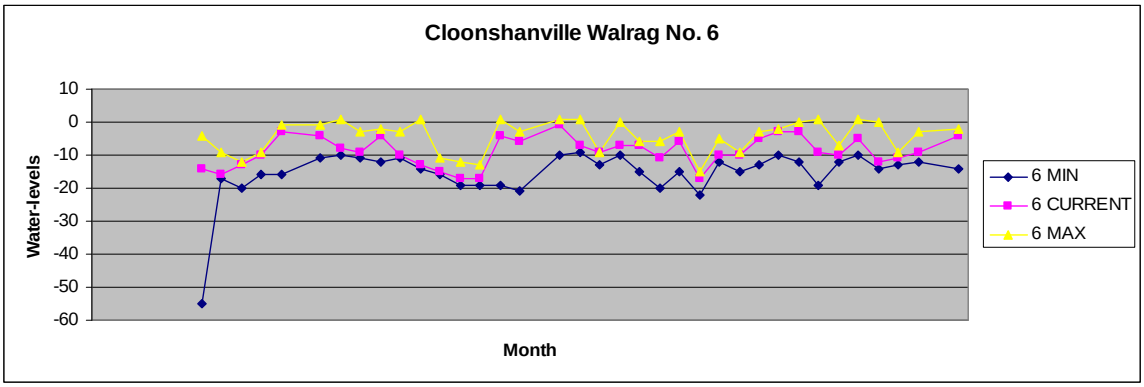


Jan 2005 (Installed) * May 2006 May 2007 Aug 2008

*Clearfell & Drain-blocking

Cloonshanville Bog Walrag 6

Located on open high bog, adjacent to northern conifer plantation, water-levels drop below 20cm prior restoration*, have risen to within 10cm post restoration

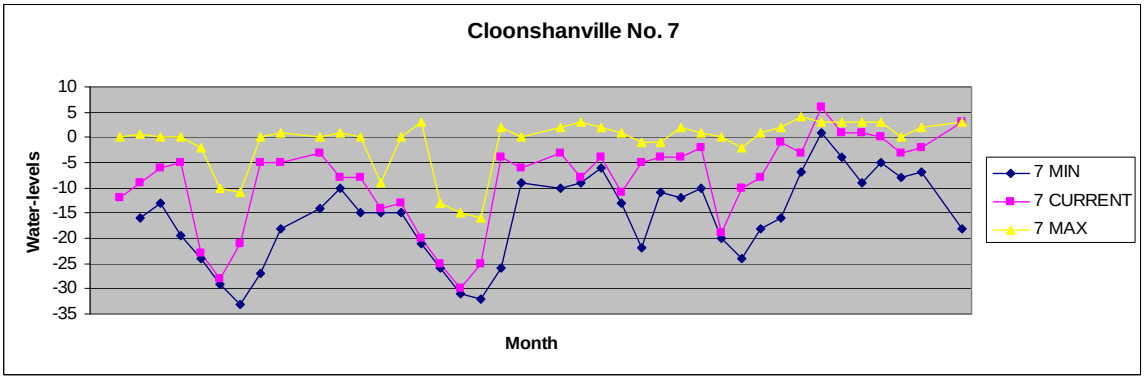


Jun 2005 (Installed) * Aug 2006 Jul 2007 Aug 2008

***Clearfell & Drain-blocking**

Cloonshanville Bog Walrag 7

Located within fell to waste on cutover bog, water-levels drop below 30cm during summer months prior restoration*, have risen to within 20cm post restoration

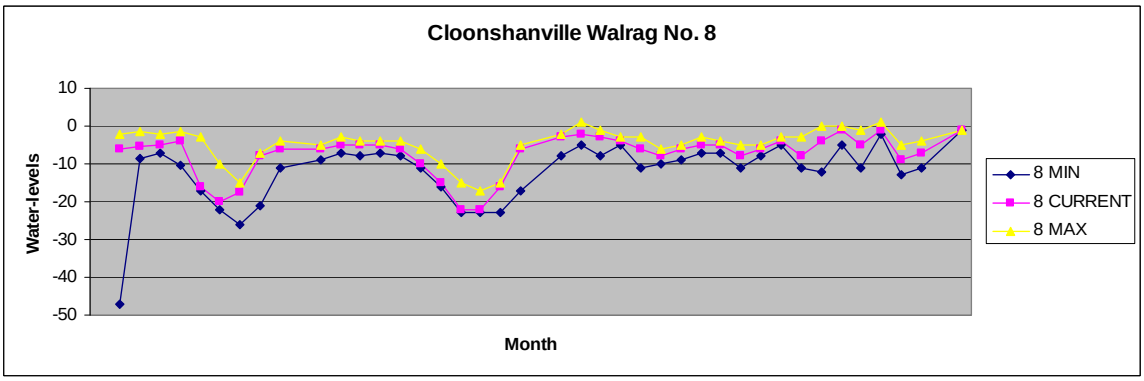


Feb 2005 (Installed) * Aug 2005 Aug 2006 Sept 2007 Aug 2008

***Clearfell & Drain-blocking**

Cloonshanville Bog Walrag 8

Located within fell to waste on fen, water-levels drop 20cm below bog surface during summer months prior restoration*, have risen to within 10cm post restoration

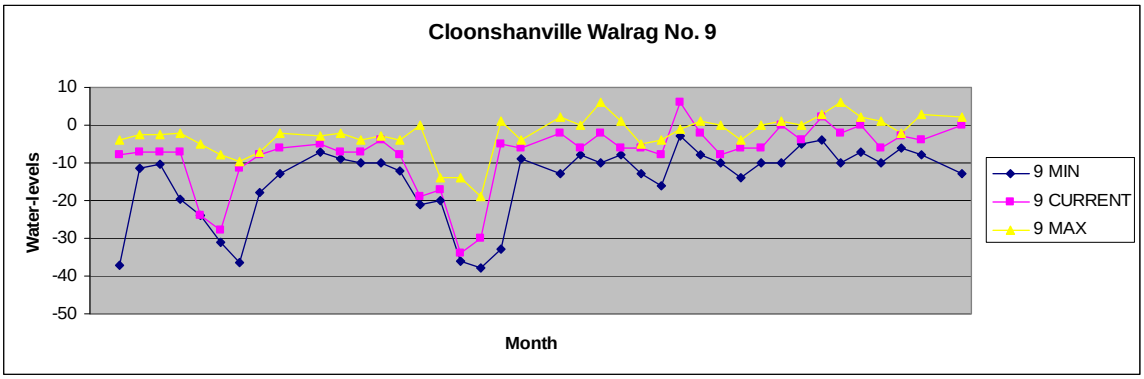


Feb 2005 (Installed) *Aug 2005 Aug 2006 Sept 2007 Aug 2008

***Clearfell & Drain-blocking**

Cloonshanville Bog Walrag 9

Located within fell to waste on northern margin of high bog, water-levels drop below 30cm prior to restoration*, have risen to within 10cm post restoration

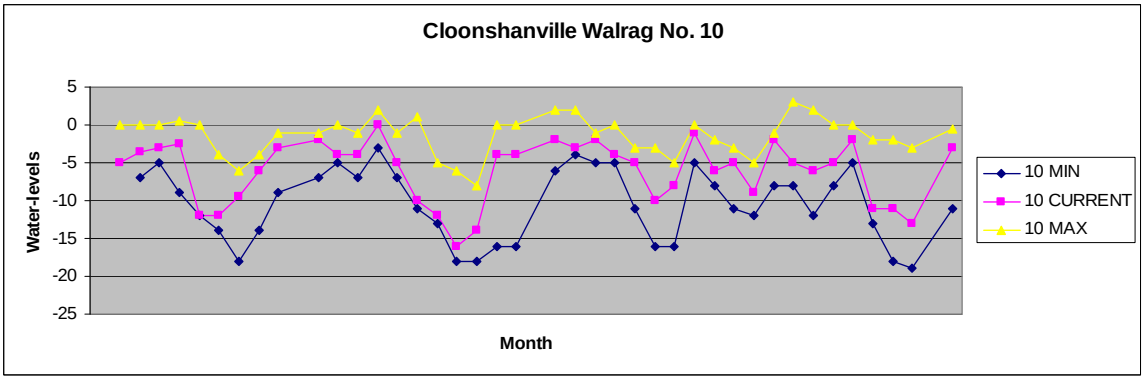


Feb 2005 (Installed) *Aug 2005 Aug 2006 Sept 2007 Aug 2008

***Clearfell & Drain-blocking**

Cloonshanville Bog Walrag 10

Located on Active Raised Bog, water-levels drop to 15cm below bog surface during summer months prior restoration*, little change recorded post restoration, however active raised bog habitat remains

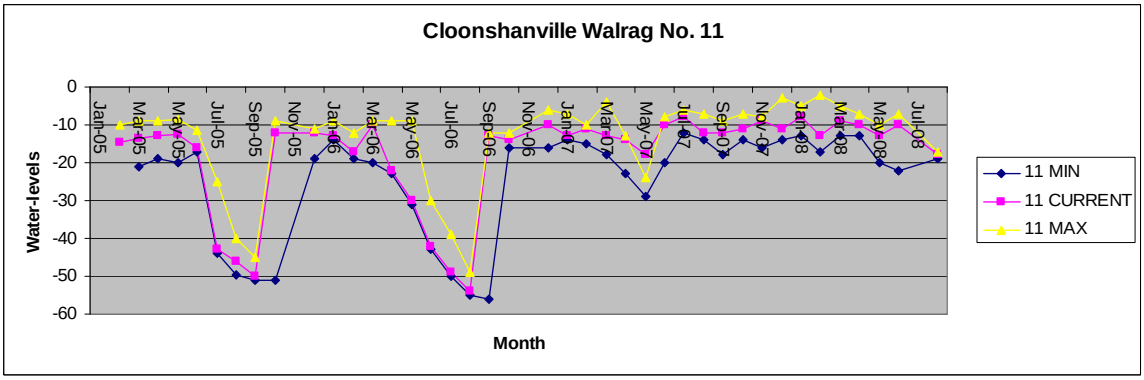


Feb 2005 (Installed) *Aug 2005 Aug 2006 Jun2007 Jun 2008

***Clearfell & Drain-blocking**

Cloonshanville Bog Walrag 11

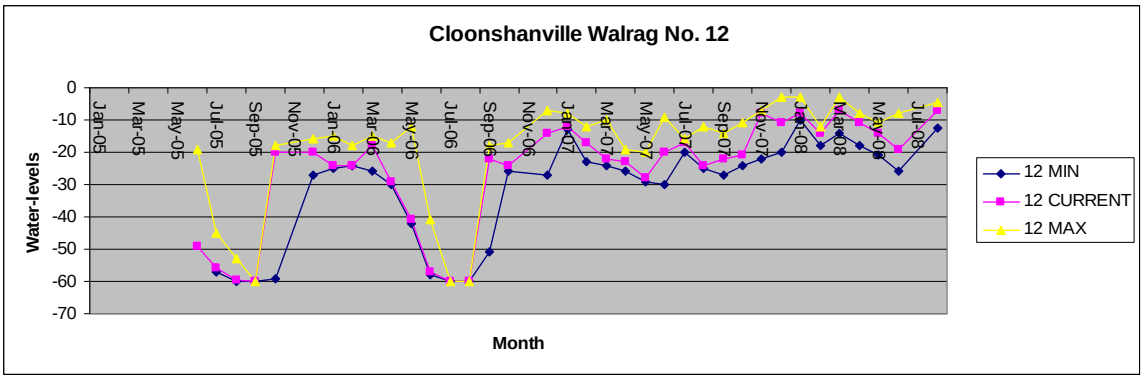
Located within Fell to waste on high bog, water-levels drop below 50cm during summer months prior to restoration*. Water-levels remain within 20cm of bog surface post restoration.



Jan 2005 (Installed) * May 2006 May 2007 May 2008

***Clearfell & Drain-blocking**

Cloonshanville Bog Walrag 12
Located within fell to waste on High Bog, water-levels drop below 60cm during summer months prior to restoration*. Water-levels remain within 30cm of bog surface post restoration.



Jan 2005 May 2005(Installed) *May 2006 May 2007 May 2008
***Clearfell & Drain-blocking**

9. Conclusions

Cloonshanville Bog is an excellent example of a raised bog habitat which supports significant areas of the Annex I Habitats, active raised bog, bog woodland, degraded raised bog (capable of regeneration) and *Rhyncosporion* depressions. It should be noted that active raised bog and bog woodland are listed as priority habitats for conservation.

This site ranks as one of the most important in Ireland and is also one of the most ecologically diverse in the country. The bog woodland area is of particularly high ecological value, ranking as one of the top 10 sites in the country. The presence of calcareous fen vegetation is also of great ecological interest as calcareous fen is rarely found in close association with areas of ombotrophic raised bog. The presence of a large population of *Sphagnum pulcrum* also adds to the conservation value of the site. The occurrence of raised bog, bog woodland and calcareous fen habitats in close proximity at one site is a very interesting hydrological situation.

In general this is an excellent site for restoration. Substantial areas of failed plantation in the north of the site have a well-developed raised bog vegetation still present and these areas should recover quickly after tree removal and some drain blocking. With the blocking of drains, water-levels have increased throughout the site. The area of planted fen in the east of the site is of great ecological interest as such fen areas are rarely encountered in association with raised bog systems. The rehabilitation of this fen area would be a very worthwhile achievement.

This site is ideally suited to being a demonstration site due to the proximity of the town of Frenchpark and also the diverse range of habitat types and restoration measures used within the site. The erection of the boardwalk and signage has been welcomed by the local community and adds to its educational potential.

10. References

Brooks, S. (2005). *Assessment of Project Sites, Restoring Raised Bog in Ireland. Coillte LIFE Nature Project.* Peatland Consulting

Conaghan, J. (2003). *Raised Bog Ecological Report.* Coillte

Curtis, T.G.F. & McGough, H.N. (1988). *The Irish Red Data Book. 1: Vascular Plants.*

Douglas, C. and Grogan, H. (1985). *Survey to locate raised bogs of scientific interest in counties Galway (E) and Roscommon. Part II.* Internal report to the Forest and Wildlife Service, Dublin.The Stationery Office, Dublin.

NPWS, 1997. Site Synopsis. National Parks and Wildlife Service, Dublin 2